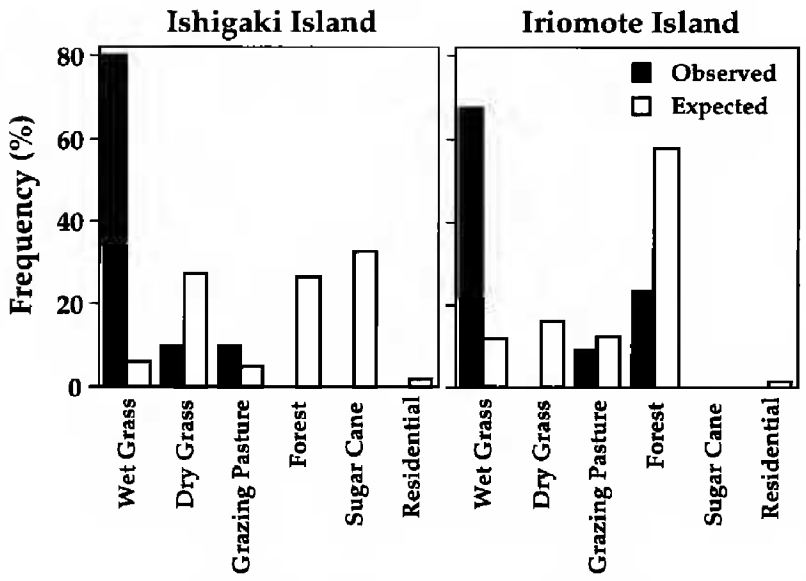

Figure 2. Habitat preference of crested serpent eagles on Ishigaki (N = 20) and Iriomote Islands (N = 77), southern Japan.

χ^2 = 225.4, $P < 0.001$; Ishigaki Island: Binomial test, P = 0.000).

Our results showed that margins of forests and wet grasslands served as important perching habitats for crested serpent eagles wintering on the Iriomote and Ishigaki Islands of Japan. There were an estimated 10 000 ha of wet grasslands along survey routes on Iriomote Island and 12 500 ha on Ishigaki Island in 1981. In 1992, there were only 5600 and 7100 ha in the same areas of Iriomote and Ishigaki Islands, respectively. Most wet grasslands had been converted to sugarcane fields or pastures. It appeared that, if further conversion of wet grasslands occurred, it would threaten the future status of the serpent eagle in this portion of its range.

RESUMEN.—Se estudiaron las preferencias de hábitat de *Spilornis cheela* en las islas de Ishigaki e Iriomote, ubicadas al sur de Japón. La águilas prefirieron los márgenes de bosques y praderas húmedas como sitios de percha. Las praderas húmedas fueron convertidas en campos de caña de azúcar y de pastura. Esta águila está listada como una "especie de interés" por la Agencia del Medioambiente de Japón. Por lo tanto, futuras conversiones de praderas para uso agrícola deben considerar la importancia de este hábitat para *S. cheela*.

[Traducción de Ivan Lazo]

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A POSSIBLE CASE OF POLYANDRY IN MONTAGU'S HARRIER

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KEY WORDS: *polyandrous association; Montagu's harrier;* Circus pygargus; *Spain.*

Monogamy is the most common mating system among raptors (Newton 1979), although alternative mating systems such as polygyny have been described in several species (see Newton 1979). In contrast, polyandry is rare and has only been described in the Harris' hawk (*Parabuteo unicinctus*) (Bednarz 1987), Galapagos hawk (*Buteo galapagoensis*) (Faaborg et al. 1980), and bearded vulture (*Gypaetus barbatus*) (Heredia and Donázar 1990). Polyandry has been described as occasionally occurring in species including kestrels (*Falco tinnunculus*) (Packham 1985), golden eagles (*Aquila chrysaetos*) (Berg 1988), pygmy falcons (*Polihierax semitorquatus*) (Thomsett 1991), and Egyptian vultures (*Neophron*

percnopterus) (Tella 1993). Polyandry is usually associated with circumstances when male breeding becomes restricted by the availability of food, mates, or nesting places (Newton 1979).

Montagu's harrier (*Circus pygargus*) is generally considered a monogamous species (Cramp and Simmons 1980), although bigyny has been recorded occasionally in the Netherlands (Hens 1926 in Cramp and Simmons 1980) and in England at very low frequencies: 1/71 nests in Cornwall (Khan in Cramp & Simmons 1980), 13/776 in Norfolk in 1923–1982 (Day 1990), 1/25 pairs in Norfolk in 1980–86 (Day 1990).

I studied an unmarked population of about 50 pairs of Montagu's harriers between 1991–1995 in northeastern Madrid (central Spain) (Arroyo 1995). It nested in cereal crop fields, and nest dispersion was clumped with pairs forming aggregations of 2–16 pairs and a median distance to the nearest neighbor being 280 m (range = 30–4300 m). As in other populations of Montagu's harriers, monogamy was the predominant mating system.

In 1992, a possible polyandrous association was observed at one nest. On 20 June, two adult males (>2 years old, as determined by plumage) were observed simultaneously bringing food to 12–16-day-old nestlings in a single nest. The first male arrived with prey at about 1600 H. The female left the nest to take the food, after which both birds perched near the nest. While the female was eating and the first male was still perched, a second male arrived with food. The female flew to this second male and took the food in a typical aerial food pass. When both birds entered the nest together, the first male was still perched in view. Between 21–25 June, the nest was observed for a total of 15 hr, during which 13 food deliveries were observed. This food delivery rate was higher than at other nests ($\bar{x}$ = 0.36, SE = 0.08 prey deliveries/hr, N = 14 nests). On four occasions both males brought food to this nest at the same time. In one instance, one of the males brought the food directly to the nestlings, while the female was engaged in an aerial food pass with the other male. On three occasions, the male (or males) waited 2–15 min until the female left the nest to take the food. This suggested that either the chicks were satiated, or that the combined feeding rate of the two males was greater than what the female could provide to the chicks.

Aggression between the two males was observed only once, with one of the males skydancing (Hamerstrom 1969) in front of the other. Both males also attacked a plastic crow which was placed near the nest from 21–25 June. The first two days both males attacked the crow as soon as they saw it. On 25 June, neither of them attacked the decoy, but both screamed at it until it was removed.

It is not known whether provisioning by both males was also made at the incubation stage, as the nest was observed for only two days in that period. On 28 May, the nest was observed between 0800 and 1000; one male was observed bringing food at 0830, but the female did not come out of the nest to take the food until 90 min later. The male perched nearby with the prey during this time, flying over the nest from time to time with the prey, and occasionally eating some of the food. On 30 May, the female was fed twice within 20 min, but the male had disappeared after the first food delivery, so it was not known if both deliveries were by the same male or not.

The nest where these observations took place was 890 m from the next nearest known nest. During the prelaying period, I observed this nest from 23–30 April and on 5 May for 1 hr each day. On the first day, two females (identifiable by plumage differences) and two males were present, and many aggressive interactions between all individuals were observed. From 30 April onward, only one pair was observed in the area, and a second nest was never found. The female was observed copulating during only two observation periods but this rate was higher than that of other pairs at a similar breeding stage.

Polyandrous associations have previously been described in Montagu's harrier in France (Cormier 1990) and England (Khan in Cramp & Simmons 1980). The case in England involved a first-summer male assisting with the provisioning of a mated female. In France, it involved a 2-yr male that had never bred before, arrived late in the season and contributed to the provisioning of a female with which it was not seen to copulate. Young males may benefit from helping already-mated females by improving their opportunity to mate with them in future years. However, remating with partners from previous years has been only rarely observed in a long-term study on wing-tagged Montagu's harriers (Bretagnolle pers. comm.), so the benefit of caring for the offspring of potential future mates may be small. In both previous records of polyandrous associations, the extra male was suggested to benefit by gaining experience for subsequent breeding attempts (Cormier 1990). The case observed in this study could have a similar explanation. However, it is also possible that both males had copulated with the female, and the second male was potentially provisioning some of his own offspring. About 4–7% of 139 copulations observed in the study area from 1992–95 were extra-pair copulations, suggesting that one of the males in the polyandrous association may have been an unmated partner that remained to help provision the chicks.

Polyandry seems to occur only occasionally in Montagu's harrier. A more detailed study with a marked population of breeding harriers would give more insight into the frequency and circumstances in which this mating system arises.

RESUMEN.—Esta nota describe una observación de un trío poliándrico en el aguilucho cenizo (*Circus pygargus*), en la que dos machos adultos alimentaron y defendieron la pollada de una misma hembra. No se tienen datos sobre el comportamiento de cópulas de estos tres individuos, pero se especula sobre la posibilidad de que ambos machos compartieran la paternidad de la pollada,

dado que se han observado cópulas extra-pareja en la población estudiada.

[Traducción Autor]

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NOTES ON THE DIET OF SHORT-EARED OWLS (*ASIO FLAMMEUS*) IN TEXAS

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KEY WORDS: *Texas; short-eared owl;* Asio flammeus; *diet.*

Although a common winter resident along the gulf coastal plain (Oberholser 1974, Rappole and Blacklock 1994), no information exists on the diet of short-eared owls (*Asio flammeus*) in Texas. This lack of information is in stark contrast to the plethora of dietary information for the species from other portions of its range (Tomkins 1936, Banfield 1947, Stegeman 1957, Munyer 1966, Clark 1975, Wiebe 1991, Rau et al. 1992, Holt 1993, Holt and Leasure 1993). Here we report the results of an analysis of short-eared owl pellets collected in the Lower Rio Grande Valley, Texas.

Between 27 February and 3 March 1995, short-eared owl pellets were collected from the Marinoff Tract, Lower Rio Grande National Wildlife Refuge, Hidalgo County, Texas. As a result of activities associated with an ongoing vegetation study, roosting short-eared owls were flushed periodically allowing for the identification of roost sites and collection of pellets. Roost sites were located on the ground in grasslands dominated by dense stands of guinea grass (*Panicum maximum*) (Gould 1975) with a mean height of 60 cm. Pellets were collected daily from each roost site until abandoned by the owls.

Pellets were dissected and prey remains collected after submerging the pellets in a 1.0% (w/v) solution of sodium chloride. After approximately 10 min in the salt solution, pellets were teased apart and allowed to remain

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